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Abstract: The advances and incorporation of information and communication technologies (ICTs) in everyday family life has earned a place of prominence in the research field. This paper provides a research synthesis of the literature published between 1998 and 2013 examining the relationship of ICTs and family functioning. Searching through databases, 42 papers were located and analyzed which enabled the conceptualization of this relationship in five domains: 1) Attitudes toward ICTs, 2) Types of ICTs and using patterns, 3) Family cohesion, 4) Family roles, rules and intergenerational conflicts, and 5) Family boundaries. Results show that ICTs have implied profound and qualitative changes in family functioning, creating new interaction scenarios and rearranging current family relational patterns. Some gaps in the literature are pointed out, such as the difference operationalization of variables and the use of non-standard instruments in the studies. Suggestions are made for clinical interventions and future research in this domain.

August 08, 2014

Dear Professor Robert Tennyson,

I am enclosing a submission to the journal *Computers in Human Behavior* entitled "Family functioning and information and communication technologies: How do they relate? A literature review". The manuscript has 34 pages and includes one table.

It has been prepared according to the journal's Instructions for Authors, has been submitted solely to this journal and is not published, in press, or submitted elsewhere. Being a current and relevant issue in the field of human and technology interaction, we believe that this work is within the scope of your journal and hope that you will consider this manuscript for publication.

The names of all the co-authors have been included. They had an active part in the manuscript and agreed with submission of it in this form. I will be serving as the corresponding author for this manuscript, and communicating with them the advances on it.

We look forward to your response and the comments of reviewers.

Sincerely,

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Highlights

- A synthesis of the literature related to ICTs and family functioning is presented;
- Studies conducted between 1998 and 2013 are analyzed;
- Emergent themes from the literature review are discussed;
- Results indicate that ICTs have implied qualitative changes in family functioning;
- Future recommendations and research directions are proposed.

***Title Page with Author details**

Family functioning and information and communication technologies: How do they relate? A literature review.

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ABSTRACT

The advances and incorporation of information and communication technologies (ICTs) in everyday family life has earned a place of prominence in the research field. This paper provides a research synthesis of the literature published between 1998 and 2013 examining the relationship of ICTs and family functioning. Searching through databases, 42 papers were located and analyzed which enabled the conceptualization of this relationship in five domains: 1) Attitudes toward ICTs, 2) Types of ICTs and using patterns, 3) Family cohesion, 4) Family roles, rules and intergenerational conflicts, and 5) Family boundaries. Results show that ICTs have implied profound and qualitative changes in family functioning, creating new interaction scenarios and rearranging current family relational patterns. Some gaps in the literature are pointed out, such as the difference operationalization of variables and the use of non-standard instruments in the studies. Suggestions are made for clinical interventions and future research in this domain.

Keywords: everyday family life; family functioning; family relations; information and communication technologies (ICTs); studies

Family functioning and information and communication technologies: How do they relate? A literature review

1 Introduction

Information and communication technologies (ICTs) include hardware (e.g., computers, smartphones, game consoles) and software (e.g., email, videoconferencing, online social networks) that sustain the digital culture (Bacigalupe & Lambe, 2011; Sttaford & Hillyer, 2012), have progressively become part of our everyday lives (Aponte, 2009; Bacigalupe & Lambe, 2011; Blinn-Pike, 2009; Correa, Hinsley, & Zúñiga, 2010; Igartua & Moral, 2012; Lanigan, 2009; Stern & Messer, 2009; Sttaford & Hillyer, 2012; Zhong, 2013). About 20 years ago families were using traditional forms of information and communication: "they were listening to music on CDs, watching movies on video home system (VHS), reading actual books, and a social network consisted of their parents' Christmas card list" (Coyne, Padilla-Walker, & Howard, 2013, p. 126). Nowadays, the internet is an extension of broader social roles and interests in the offline world (Colley & Maltby, 2008), which can enhance the social lives of its users (Amichai-Hamburger & Hayat, 2011). According to the latest publication of the Eurostat (2014), in 2013, 79% of European Union households (28 countries) have computers with internet access. More specifically, this is true of 94% of the households in Norway, 88% in the U.K., 80% in Belgium, 70% in Spain and 62% in Portugal. Moreover, the percentage of daily frequency of internet use within the last year in these countries is about 85% in Norway, 78% in the U.K., 68% in Belgium, 54% in Spain and 48% in Portugal. In the U.S.A., according to a survey from the Pew Research Center's Internet & American Life Project (2014), 86% of American adults used the internet in 2013, 90% have a cell phone and 42% own a tablet computer. But it is among the youngest (12-17 years old) that the percentage of internet

use is most widespread: 95% of American teenagers are online and 74% access the internet on cell phones, tablets, and other mobile devices.

In recent years, the advances and incorporation of ICTs into everyday life have potentially created new interaction scenarios and rearrangements in current family and social relational models, based on a network society (Aponte, 2009; Bacigalupe & Lambe, 2011; Lanigan, 2009; Stern & Messer, 2009; Sttaford & Hillyer, 2012). However, if the impact of rapid technological advances and their immersion in the experiences of everyday life have become strong targets of investigation, the truth is that the role and impact on family dynamics is still at an early stage of research (Aponte, 2009; Coyne, Bushman, & Nathanson, 2012; Şenyürekl & Detzner, 2009; Stafford & Hillyer, 2012; Williams & Merten, 2011).

2 Boundaries of the Review

2.1 Objectives

As a topic of research, it seems relevant to provide a comprehensive review of the existing literature in this domain. Thus, this review intends to explore the relationship between ICTs and family functioning, to provide a better understanding of the interaction between ICTs and family life, as well as to identify gaps in the current literature and to suggest directions for future research. More specifically, we aim to answer the following research questions:

RQ1: Which are the ICTs used by families?

RQ2: Which are the variables of family functioning most related to ICT use?

RQ3: How do ICTs and family functioning interact?

2.2 Method

The review includes a search of the relevant research literature. Therefore, electronic academic databases were consulted (Proquest, Ovid, B-on, Wok, Ebsco and Emerald) and

also both general and the scholarly search engines (Google and Google Scholar), using combinations of the words: “family”, “ICTs”, “family functioning”, “relations”, “internet”, and related terms (in English, Portuguese and Spanish). To complement this, research was done in books following the same criteria.

From the 257 references found in the initial search, only 42 met the inclusion criteria established for this study: (a) published between 1998 and 2013, (b) written in English, Portuguese or Spanish, (c) including at least one ICT, (d) and containing at least one variable of family functioning. A cut-off point of 15 years was made because there is little literature about this research topic before 2000. Most of the technology that exists today wasn’t present within families 20 years ago, so references written before 1998 were excluded, as well as those papers not focusing on the interaction between family functioning and ICT usage. The 42 references that met the inclusion criteria were selected based on a reading of the abstract and then by the analysis of the whole text, in terms of the following characteristics: authors and the year in which the research was published; country in which the studies were developed; research design, including sample size, ICTs and family functioning variables, method, instruments used, and principal results achieved. Table 1 gives an overview of all these studies and a discussion of them is presented below.

The papers selected are empirical studies, literature reviews, theoretical articles, case studies, and other types of articles. Regarding the empirical ones, we can find a wide range of aims, designs, samples, and variables considered. They total 30 empirical studies, conducted in different countries such as Belgium, China, India, Israel, Korea, Spain, Portugal, the United Kingdom (U.K.), Turkey and the United States (U.S.), between 2002 and 2013. Mostly are cross-sectional designs (22) and less than half of these studies are longitudinal (8); the preference for quantitative methodologies is clear (19), followed by the qualitative (9) with mixed design being in the minority (2). The instruments mostly

used were questionnaires (presence and online), some constructed specifically for the research topic in question (15), followed by interviews (9) conducted separately or with the whole family, and a combination of questionnaires and interviews (6). The theoretical articles add up to six of the references found and were written between 1999 and 2012, including the redefinition of concepts that emerged from the interaction between ICTs and everyday family life, and the synthesis of paradigmatic researches in this domain. At least, two case studies, three comments (guest editor's note) and one research syntheses was found.

3 ICTs, Individual Use and Impact on Family Functioning

3.1 Information and Communication Technologies (ICTs)

3.1.1 Attitudes toward ICTs. Initially, ICTs appeared in the literature associated with the professional sphere. Only recently has this concept been employed related to personal relationships (Coyne, Stockdale, Busby, Iverson, & Grant, 2011; Strafford & Hillyer, 2012), in part due to the development of another parallel research field, computer mediated communication (CMC). From the 1990s, the rapid technological development (e.g., virtual reality, multimedia systems) have been reflected in profound changes in social and family life (Aponte, 2009; Blinn-Pike, 2009), due to the domestication of these technologies by families (Haddon, 2006) and reciprocal technological developments, which progressively create equipment which is more sophisticated and adapted to the family context (Blinn-Pike, 2009). The domestication of ICTs is the process in which new and unfamiliar technologies are introduced in the family context and come under control of the users, raising feelings of excitement but also threat (Blinn-Pike, 2009; Haddon, 2006; Mesch, 2006a). This implies a "two way interaction in which the family members change the meaning and the impact of technologies and, in turn, the process of culture and family interactions are changed" (Blinn-Pike, 2009, p. 571). According to this theory, two

directions are taken: the incorporation of ICTs with the technology becoming acceptable and familiar in everyday life of the household (e.g., the location of the equipment at home, integration of the ICTs in family routines), and conversion, reflected by the attitudes that signalize their use (e.g., public exhibition, computer location at home to facilitate the monitoring of use; Haddon, 2006).

Stevenson (2011) in the U.K., found that personal computers are essentially acquired for educational purposes as an extension of school activities at home. Concerning the acquisition process, Haddon (2006) referred that individuals invest with their own personal meanings and significance before purchasing ICTs. These include the expectation of the place they will find at home and their role in people's lives, which usually drives discussions about their purchase. Regarding this, Kaur and Medury (2011) performed a research in India trying to assess the impact that the internet has on adolescents' influence on family purchases. The results showed that adolescents in urban Indian households were significantly influenced by the internet and this influence was positively related to their role in family purchase decisions. Thus, to understand the adoption and use of ICTs by families, it is important to focus on the interaction between household members and the rules which regulate their functioning (Coyne, Bushman, et al., 2012). In this context, Livingstone (2007) suggests two distinct levels of analysis: a pragmatic one, assessing the options of purchase and the location of the ICTs at home, and a symbolic one, translated by the expectations and rules of their use.

Based on the domestication theory, Hertlein (2012) suggests a conceptual multitheoretical model about the role of ICTs in everyday couple and family life, which provides us with the most useful framework for understanding how the use of media by families might influence family functioning as a system. This model is informed by domestication theory and based on the integration of three theories: the family ecology

perspective, which focuses on how the environment variables affect families, the structural-functional perspective, which addresses how families are organized to meet their needs, and the interaction-constructionist perspective, that focuses on how family members develop their relationships, communicate to each other and manage family rituals. It consists of a trilogy of reciprocal interdependencies between ecological influences (e.g., anonymity, accessibility), changes in the structure (e.g., redefinition of rules, roles and boundaries), and changes in the process (e.g., redefinition of intimacy, communication and disruption of rituals) of relationships. For example, rules around cell phone usage may result in changes to the way that adolescents interact with friends and family, which represents a structure to process changes.

3.1.2 Types of ICTs and using patterns. In recent years, as a result of technological advances and the growing number of ICT users, there has been an exponential increase in the connections and interactions established between network users (Sttaford & Hillyer, 2012). The interconnectedness facilitated by mobile services and the dissemination of social networking sites (SNSs; Ellison & boyd, 2013) made the emergence of new patterns of technology use possible (Haythornthwaite, 2005; Houghton & Joinson, 2010; Sttaford & Hillyer, 2012; Bu Zhong, 2013). There seem to be differences between the traditional patterns of communication (e.g., face-to-face) and the new patterns, served by ICTs and characterized by the use of a plurality of media technology and the increased risk of addiction to it (Stern & Messer, 2009). Multicommunication, media multiplexity and perpetual connectivity are examples of these new ICT patterns and represent revolutions in the modes of human relationships (Sttaford & Hillyer, 2012). Whereas multicommunication refers to interacting with multiple individuals simultaneously (e.g., managing a chat conversation while simultaneously updating a tweet on Twitter), media multiplexity (Haythornthwaite, 2005) focuses on the diversity of means to interact with the

same individual (e.g., a couple using mobile phones, videoconference and email to organize a weekend together). Multicommunication and media multiplexity both contribute to another phenomenon of the modern world: perpetual connectivity. This new pattern is related to the constant need to be contactable, it "is no longer a matter of going online, but being online" (Williams & Merten, 2011, p.150), visible for example in the incessant checking of one's email inbox or in the permanent status updating in social networking sites (SNSs).

According to Brandtzæg (2010), it is very difficult to understand user behavior because media usage is often dynamic and complex. Thus, rapid media evolution, the increasing access to a variety of new media, individual preferences and different lifestyles adopted are becoming important variables to take into consideration. In this context, the author suggested a unified Media-User Typology (MUT) which defines types by media behavior (e.g., non-users, socializers, advanced user) according to the level of frequency, the variety of use, the content/activity preferences and the media platform used. As an example, a socializer is characterized by a medium frequency and variety of use, with socializing activities, using SNSs, keeping in touch with friends, family and connecting with new acquaintances, in a less organized, spontaneous and flexible way.

When we look into families as a unit of analysis we realize that the difficulty in establishing patterns of ICTs use is even broader. Van Rompaey, Roe and Struys (2002), created a typology based on family ICT possession: the traditional, characterized by low technological density (54% of the cases; e.g., television and a low number of audio systems), intermediate (31%; medium technological density, including more televisions and audio systems), and the multimedia, characterized by high technological density, including the possession of new technologies (15%; e.g., internet and email). However, besides the technological resources that the families have, the discussions about the role

they assume in their lives and the amount of time they spend using them (Huisman, Catapano & Edwards, 2012), other variables may influence the selection of the ICTs and their pattern of use, such as: the stage of the family life cycle (Bacigalupe, 2011; Bartholomew, Schoppe-Sullivan, Glassman & Dush, 2012; Coyne, Bushman, et al., 2012; Davies & Gentile, 2012; Lanigan, 2009; Mesch, 2006b; Watt & White, 1999), the geographical distance to the family members (Bacigalupe & Lambe, 2011; Şenyürekl &Detzner, 2009; Stern & Messer, 2009), the communication strategies established by the family (Devitt & Roker, 2009; Stern & Messer, 2009) and cultural differences (Chesley & Fox, 2012; Şenyürekl &Detzner, 2009).

Within families, children seem to be a powerful factor in internet acquisition and use (Van Rompaey et al., 2002), since personal computers are essentially acquired by parents as an extension of school activities at home (Stevenson, 2011). In preschool they seem to prefer to use television (Huisman et al., 2012) and this pattern of television use seems to influence families to adopt more positive media habits (e.g., watch educational programs) in families in the earlier stages of their life cycle, with siblings and with larger age gaps in sibling spacing (Davies & Gentile, 2012).

The studies conducted with adolescents and their families pointed to a change in their attitudes and values (Cardoso, Espanha, & Lapa, 2008; Bacigalupe & Camara, 2011). "Street culture" has been changed into "room culture" (Bacigalupe, 2011; Mesch, 2006b), where adolescents are isolated in their rooms playing and communicating with friends (Cardoso et al., 2008). The pattern of ICT use seems to vary between email (Padilla-Walker, Coyne, & Fraser, 2012; Şenyürekl & Detzner, 2009), SNSs (Huisman et al., 2012; Padilla-Walker et al., 2012), video games (Cardoso et al., 2008) and cell phone (Padilla-Walker et al., 2012). Furthermore, not only was a gender difference found, since female practice seems confined to more online conversations and the male tendency is to play

online video games, but a supplement and extension of new ICTs technologies was also found in relation to traditional ones (e.g., the replacement of the landline phone call for online chats for females, and the decline of television use with the use of online videogames for males; Cardoso et al., 2008; Van Rompaey et al., 2002).

In adulthood, Huisman, Catapano and Edwards (2012) found that adults seem to mostly use email and chats to interact and communicate with friends and extended family. More specifically, Chesley and Fox (2012) showed that women use email more than men to communicate with family members. This study also suggests the existence of cultural differences in the use of ICTs, since Hispanics and African Americans reported a lower use of email compared to Caucasians. This fact seems to be justified by some ecological influences (e.g., access to ICTs, lack of confidence in the privacy policies of email) experienced by Hispanics and African Americans. Considering the stage of transition to parenthood, a longitudinal study by Bartholomew et al. (2012) showed that mothers used Facebook more than fathers and increased its use over that transition, as a result of higher levels of parenting stress.

The literature also shows that the patterns of communication adopted by families can vary according to other variables, such as the location of its members and the geographical distance to the family (Bacigalupe & Lambe, 2011; Devitt & Roker, 2009; Şenyürekl &Detzner, 2009; Stern & Messer, 2009). When distances are larger, there is an elevated use of email and cell phone (Stern & Messer, 2009), especially in transnational families, to maintain relationships over such distance and time (Şenyürekl &Detzner, 2009). In contrast, face-to-face communication and telephone calls are more often used when distances are smaller (Stern & Messer, 2009). According to Coyne, Stockdale, Busby, Iverson and Grant (2011) different forms of media are used within couple relationships, cell phones in conversations or texting messages being those primarily used. In addition,

relationship satisfaction seems not to predict specific use of media but does predict several reasons for media use (e.g., expressing affection). Devitt and Roker (2009) argued that cell phones seem to have changed some aspects of family functioning as well as relationships, in a positive way. This device is seen as a key way for modern families to keep in touch (e.g., make plans) and ensure children's safety (e.g., means of communication in emergency situations). Concerning the use of cell phones, parents would rather talk (and listen to their children's voice) while their children showed a preference for text messages, especially regarding difficult subjects. According to Lanigan (2009), this equipment allows families to coordinate daily activities in real time, and unlike a landline, it exhibits a pattern of personal use. Although this type of technology has been associated with promoting family communication, this author notes that in contrast, it also has the potential to reduce the communication content or context (e.g., lack of nonverbal signals in a voice call).

3.2 Family Functioning and ICTs

Family functioning, understood as a process in which members interact with each other to meet basic needs, make decisions, establish rules, and define goals, contributes simultaneously to individual and family development (Lanigan, 2009). Thus, according to the Multitheoretical model of Hertlein (2012), the introduction of ICTs in the family context (ecological influence) can change (the structure and the process of) family dynamics, leading to (re)adaptations to the arrival of this new element (Sotero, Cunha, & Relvas, 2011). Most recently, research focused on this topic has highlighted particular aspects of family functioning such as communication, cohesion, roles, rules, intergenerational conflicts and boundaries. Thus, the main studies associated with these variables are presented next.

3.2.1 Family communication. Due to the proliferation of new technologies the number of ways in which it is possible to communicate has undergone exponential growth in recent years (Stern & Messer, 2009). Traditional forms of communication such as face-to-face or using landlines, have today assumed new technological formats to include email and cell phones (Coyne, Bushman, et al., 2012; Stern & Messer, 2009), for example. The daily management of family activities in real time through mobile devices (Devitt & Roker, 2009; Hertlein, 2012; Lanigan, 2009; Stern & Messer, 2009; Watt & White, 1999), such as paying bills online or changing appointments by phone, tends to induce feelings of safety for those who have these technologies (Devitt & Roker, 2009). Furthermore, ICTs release the family from time constraints and allow, through a wide range of devices (Stern & Messer, 2009; Sttaford & Hillyer, 2012), the maintenance of family relations. Not only have ICTs contributed decisively to the maintenance of these relations (Aponte, 2009; Bacigalupe, 2011; Bacigalupe & Lambe, 2011; Şenyürekl & Detzner, 2009; Sttaford & Hillyer, 2012), but they have also made possible the development of new communication patterns, worldwide, in real time and at a relatively low cost of use (Lanigan, 2009; Stern & Messer, 2009). As an example, we can see the positive impact that ICTs have had on transnational families: changing from expensive forms of communication to adopt new, low cost technologies, which have enabled the maintenance and (re)creation of family bonds, despite geographical distance (Bacigalupe & Lambe, 2011), and in effective co-parenting relationships after divorce, making easier for parents to plan and make conjoint decisions about their children (Ganong, Coleman, Feistman, Jamison, & Markham, 2012). However, the emergence of new technologies and patterns of communication has also facilitated the exposure of users to a variety of risks. Particular using patterns as multicommunication and perpetual connectivity (Sttaford & Hillyer, 2012), visible for example in the explosion of friends connected in SNSs and information shared worldwide

(Bacigalupe & Camera, 2011), can lead to situations of loss of family control on virtual interactions (Mesch, 2006a, 2006b; Stern & Messer, 2009). If these virtual sets tend to facilitate the maintenance of family relationships, little has been investigated about their impact on their establishment and rupture (Sttaford & Hillyer, 2012). Therefore, some authors recognize that ICTs can have a negative influence on communication, impacting on the quality of family relationships (Nie, 2001; Watt & White, 1999). For example, the disconnection between verbal and nonverbal signals can result in misunderstanding or family members in the same house becoming isolated from each other instead of establishing personal connections (Cardoso et al., 2008; Huisman et al., 2012; Mesch, 2006b; Watt & White, 1999; Williams & Merten, 2011). Nie (2001) has become a paradigmatic reference for the concept of inelasticity of time, reiterating that the more time individuals spend in activities involving ICTs, the lower the amount of time devoted to other activities (e.g., outdoor activities). In 2001, in the U.S., the same author conducted a study on the influence of the internet on the quantity and quality of communication and interpersonal relationships. He concluded that internet users already had a competitive advantage compared to non-users (e.g., younger; higher degree of social connectivity), so they did not become more sociable and may actually reduce interpersonal interaction and communication.

3.2.2 Family cohesion. Family cohesion conceptualized as the emotional bonding shared by family members (Olson, Russel, & Sprenkle, 1983), has proved to be a variable with contradictory results when analyzed under the influence of ICTs. Some studies report that ICTs tend to increase the time spent as a family (Chesley & Fox, 2012; Devitt & Roker, 2009; Lanigan, 2009; Plowman, McPake, & Stephen, 2010) and strengthen family bonds (Bacigalupe & Lambe, 2011; Chesley & Fox, 2012; Kanter, Afifi, & Robbins, 2012; Lanigan, 2009; Stern & Messer, 2009; Stevenson, 2011; Bu Zhong, 2013), improving

family communication and increasing intimacy among members (Şenyürekl & Detzner, 2009; Wang, Bianchi, & Raley, 2005). This is evident through sharing online activities between parents and children (Padilla-Walker, Coyne, & Fraser, 2012; Stevenson, 2011; Williams & Merten, 2011) and current daily management activities using ICTs (Devitt & Roker, 2009; Hertlein, 2012; Lanigan, 2009; Stern & Messer, 2009; Watt & White, 1999).

About the contextual complexity of ICTs interactions in family life, Lanigan (2009) applies a sociotechnological model as an analysis grid to a research conducted by the author on the perception of the impact of the use of personal computers on family relationships. The results suggest that the more time families spend using these ICTs, the higher the level of cohesion, adaptability and communication revealed by the family. Similarly, in Chesley and Fox's (2012) research, most women stated a positive effect on family relationships, with a reinforcement of the bonds besides the time saved in family communication.

The results obtained by Stevenson (2011) also point to the positive impact of ICTs in terms of family relationships, adding some variables that mediate the process of adjustment of households to ICTs, including the availability of parents to engage in activities with their children and the desire to establish and maintain family rules. In addition, adolescents spending time in family activities such as eating meals, chatting, shopping and, especially with their mothers, had a higher level of perceived social support and a lower level of internet addiction (Gunuc & Dogan, 2013).

Bacigalupe (2011) argues that the quick adoption of ICTs by households may respond to a deep cultural need to strengthen and maintain family intimacy and community bonds, especially with transnational families. Despite geographical distance, ICT use can enable any family to be virtually present (Aponte, 2009; Stern & Messer, 2009; Mickus & Luz, 2002; Sttaford & Hillyer, 2012), and so ICTs are a "splendid opportunity to maintain

legacies, create new memories and to establish a coherent identity and continuity for family members" (Bacigalupe & Lambe, 2011, p. 22) at a low cost.

Partially supporting this hypothesis and focused on a distinct sample, Mikus and Luz (2002) conducted an investigation to test the feasibility of using low cost videophones on the frequency and quality of communication between nursing home residents and their families. The results pointed out that videophones can be used successfully for nursing home residents, leading to more satisfying social interactions, regardless of distance. The accessibility to this type of technology offers the potential to reduce isolation among them and their families.

Nevertheless, some empirical evidence points to mixed effects (Williams & Merten, 2011) or even in the opposite direction, making a negative association with the frequency of use of new technologies and the perception of family cohesion (Mesch, 2003, 2006b). Williams and Merten (2011) in two studies explored the use of several technologies for adolescents and their parents in order to verify the impact of these technologies on the family connection and parent-child relational dynamics. Thus, on the one hand, ICTs are perceived by parents as facilitating family closeness and increasing of the quality of communication. On the other hand, the large amount of technological equipment and high frequency of use seems to be related to a reduction of family time and intimacy between family members, leading to the isolation of those who live in the same house. In 2003, Mesch, exploring the relationship between the daily use of the internet, the amount of family time and the perception of quality of family relationships, concluded that the greater the frequency of internet use by young people, the lower the perception of relational quality with their parents. Parent-child closeness is due mainly to family characteristics and opportunities for interaction (e.g., surfing the internet as a new joint activity for families). However, he adds that this negative relationship was not due to the frequency of

internet use *per se*, but the existence of another variable: the type of online activity. Three years later, this author confirmed that the frequency of teenagers' internet use is negatively associated with family time and positively associated with family conflicts, creating the perception of a decline in family cohesion. He also found different effects due to the type of internet use. Thus, if the purpose is educational, the quality of adolescent-parent relationship increases, whereas if the purpose is entertainment it does not seem to have any relation but it may raise intergenerational conflicts. This author suggests further research on this topic to expand it to other stages of the family life cycle, as families can experience different levels of cohesion associated with the same activity, according to the which stage they are at (Watt & White, 1999). For example, we can cite the contrast between the results obtained in this study, which includes a sample of parents with adolescents, and hypothesize a sample of families in the empty nest stage, where the frequency and use of the internet may be the preferred vehicle for communication and, consequently, be associated with a higher level of family cohesion.

3.2.3 Family roles, rules and intergenerational conflicts. Some research published about the use of new technologies focuses on the reduction of time spent as a family (Huisman et al., 2012; Mesch, 2003, 2006b; Nie, 2001), arguing that the use of ICTs does not make people more sociable (Nie, 2001), and tends to facilitate the occurrence of couple (Coyne et al., 2011) and intergenerational conflicts (Bacigalupe & Camera, 2011; Huisman et al., 2012; Kiesler, Zdaniuk, Lundmark, & Kraut, 2000; Livingstone, 2007; Mesch, 2003, 2006a , 2006b; Van Rompaey et al., 2002), as well as hindering the exercise of parenting (Huisman et al., 2012).

A study conducted by Coyne et al. (2012), assessed how playing video games could influence conflict in couple relationships. The results show that the amount of time men spent playing video games led to conflicts about the media, which were related to physical

and relational aggression. In response to the discrepancy of the results found in family time studies, Lee and Chae (2007) tried to clarify family and communication time concepts. They argued that family time involves both active and passive time (in which the family does nothing), while the communication time includes only the active family time. Thus, they conducted an investigation in Korea, operationalizing these two variables separately, and concluded that the total time that families spend on internet use is associated with a decrease in family time, but not in communication time. The decrease is due to online activity performed by children. In the case of educational activities for which the technology was acquired, there is no decrease in this variable. However, for entertainment activities (e.g., online games), there is a decrease in communication time. Integrating the type of activity performed with ICTs and the family time, other authors (Huisman et al., 2012; Mesch, 2006a; Mesch, 2006b) have reached similar results. In fact, as well as the use of ICTs by children for entertainment purposes being seen as decreasing the family time, it is also strongly associated with the existence of intergenerational conflicts.

Families are characterized by a hierarchy of authority. When new information enters the family system, it transforms into new roles or expertise alongside the existing ones, and may lead to relational changes (Mesch, 2006a;Watt & White, 1999). For example, the introduction of the computer has the potential to change this hierarchy, with the adolescent becoming a technological expert who monopolizes the equipment and from whom the other members of the family must request help (Watt & White, 1999). This adolescent, usually male, tend to adopt the role of a guru in computers, a fact that creates discomfort in adults not familiar with this technology and leads to family conflicts (Kiesler et al., 2000). It seems to corroborate the hypothesis of the redefinition of family roles. ICTs have the potential to change family patterns of interaction due to the differentiation of roles and levels of expertise, and when a family guru emerges, a new dynamic is introduced into

families: the adolescent's role at the interface of the family and the digital world (Kiesler et al., 2000), which often culminates in conflict situations (Mesch, 2006a). According to Mesch (2006a), the greatest experiences of conflict in families seem to be those where a young computer expert is distinguished from the other family members or in which parents show more concern about the potential negative effects of internet use. In addition, the focus of discussion and conflict due to internet access and use seem to be not only between parents and children, but also between siblings (Van Rompaey et al., 2002).

Livingstone (2007) considers other variables behind the conflict, arguing that these situations are caused more by issues of independence, responsibility and costs than by the ICT use. However, Bacigalupe draws attention to the fact that the tasks of adolescence such as negotiation of autonomy and independence, may became a central issue of teen technology interactions (Bacigalupe, 2011).

The empirical evidence appears to point to an enhancement of the development of technological abilities by young people which tends to increase the digital gap between generations (Bacigalupe & Camera, 2011; Lanigan, 2009; Mesch, 2006a), and to deflect parental authority, by questioning rules and values that they try to transmit (Bacigalupe & Camera, 2011; Haddon, 2006; Huisman et al., 2012; Mesch, 2006a; Stevenson, 2011). This puts them in the dilemma of parenting without a reference model regarding ICTs, as these devices have emerged too late in their lives (Plowman et al., 2010).

The internet poses multiple challenges to parents who see it as a source of funds for the development of their children but, at the same time, want to protect them from inappropriate content. Thus, they resort to various educational strategies ranging from restricting access through specific software and checking the browsing history, to setting up rules, or negotiating its use.

Wang et al. (2005) studied parental monitoring of internet use by children, concluding that parents regulate internet use by defining rules and checking visited sites. An important fact is the high discrepancy between informants regarding the monitoring (Wang et al., 2005). This may be due to the fact that "parents and adolescents do not share the same definition of monitoring, nor do they share similar experiences of or sensitivity to parents' monitoring behaviors" (Williams & Merten, 2011, p. 153). However, when parental norms are consistent with the children's internet use, the risk of developing problems with internet use seems to be reduced (Liu, Fang, Deng, & Zhang, 2012).

Divided between restriction and access to ICTs, parents who participated in studies by Livingstone (2007) and Williams and Merten (2011) reported a major use of trading strategies of family rules and roles. The first author adds that more than the potential effect of ICTs is the progressive change of parent-child relationships that regulates the familiar patterns of use.

3.2.4 Family boundaries. ICTs have the potential to modify the permeability of family boundaries due to the change of the flow of information. If on the one hand, the family gets unrestricted access to a diversity of information unprecedented in our history, on the other hand they become more exposed, blending external world with family environments (Lanigan, 2009; Mesch, 2006b; Stafford & Hillyer, 2012). With this perspective in mind, Mesch (2006b) uses the metaphor of "backstage" and "front stage" to explain the dilution of family boundaries. The backstage might be seen as the house, where the family creates its identity and where members can express their intimacy and feelings. The front stage could be the public sphere where individuals' behavior is framed according to the expectations, roles and rules that society imposes to them. Thus, boundaries between the family environment and the external world are relevant and necessary, but are being blurred by the domestic use of ICTs. Also through the use of the boundary metaphor,

Communication Privacy Management theory (CPM) illustrates the way people manage their privacy, personally and in their relationships (Petronio, Caughlin, Braithwaite, & Baxter, 2006). Recently, CPM has been used to explore how parents and children negotiate rules and boundaries using ICTs, such as Facebook (Child & Westermann, 2013). Following this idea and as a consequence of the change of habits and family routines (Haddon, 2006; Hertlein, 2012; Mesch, 2003, 2006a, 2006b), in some families there occurs a progressive blurring of the boundaries of family and work. If the pattern applicant is that children and parents leave the house every day to go to school and work, the invasion of work in the sphere of family life seems to become increasingly frequent (Lanigan, 2009; Stafford & Hillyer, 2012; Williams & Merten, 2011). Children doing homework on a personal computer (Stevenson, 2011) and parents who start to work from home (Huisman et al., 2012; Stafford & Hillyer, 2012), are just two examples. The potential weakening of family boundaries may also increase the exposure of households to vulnerabilities (Lanigan, 2009; Hertlein, 2012) and lead families into risky situations such as lack of privacy and of family safety (Davies & Gentile, 2012; Lanigan, 2009; Mesch, 2006b; Sttaford & Hillyer, 2012; Williams & Merten, 2011). Examples of this are contact with inappropriate content, happy slapping, child grooming (Bacigalupe & Lambe, 2011; Cardoso et al., 2008; Devitt & Roker, 2009) and involvement in situations of loss of control over virtual interactions (Liu et al., 2012; Sttaford & Hillyer, 2012; Stern & Messer, 2009), such as cybersex (Schneider, Weiss, & Samenow, 2012).

Hertlein (2012), in her multitheoretical model, contemplates the existence of ecological influences that act as potential vulnerabilities for families and couples that use ICTs: anonymity, accessibility, affordability, approximation, acceptability, accommodation, and ambiguity. In this context of risks and vulnerabilities to which new technologies can expose families, Bacigalupe and Lambe (2011) state that the literature

tends to be alarmist, pointing out the negative effects of the use of ICTs and relating them to negative and problematic behaviors (e.g., cyber bullying, online infidelity), and neglect a perspective focused on the potential strengthening of family bonds. Exceptions to this rule are, for example, the studies of Child and Westermann (2013), Kanter, Afifi, and Robbins (2012), Plowman et al. (2010) and Rocker and Devitt (2009). In the first two, parents made a Facebook friend request to their young-adult children. In both, children did not experience a privacy invasion when contemplating parental connections on Facebook and in the cases in which they had a more conflicted relationship prior to the parent joining Facebook, the parent's presence on Facebook also enhanced the child's closeness with the parent. In the latter study, families reported that the use of cell phones changed particular aspects of family relationships, pointing out more positive effects (e.g., safety and independence feelings) rather than negative ones (e.g., happy slapping). To be highlighted is that these studies report concerns from parents regarding the use of technology by their children. But instead of thinking about the ICTs as a threat, these parents emphasized the relationships, the values, the culture, and the adaptive attitudes to cope together with the risks to which ICTs expose them.

4 Conclusion

This review shows that ICTs introduce profound qualitative and unprecedented changes in the way that members of today's families interact with each other (Amichai-Hamburger & Hayat, 2011; Aponte, 2009; Cardoso et al., 2008; Hertlein, 2012; Lanigan, 2009; Sttaford & Hillyer, 2012). However, the results are inconsistent. Mostly, researches focus on different ICTs (e.g., cell phone, videoconference) emphasizing partial variables of family functioning (e.g., cohesion, conflict) and are limited to specific stages of the family life cycle, such as couples (e.g., Bartholomew et al., 2012; Ganong et al., 2012; Schneider et al., 2012), couples with children in school (e.g., Chesley & Fox, 2012; Lee & Chae,

2007) and couples with adolescent children (e.g., Bacigalupe & Camera, 2011; Padilla-Walker et al., 2012).

As reflected in the literature reviewed, the globalism of this phenomenon has triggered different directions of research around the world, allowing the integration of transnational realities and multicultural studies (e.g., Bacigalupe & Lambe, 2011; Chesley & Fox, 2012; Liu et al., 2012; Şenyürekl & Detzner, 2009). In this review different uses of ICTs are evidenced (e.g., education, entertainment), distinct meanings associated with these technologies are highlighted (e.g., work tool, communication vehicle) and hypothetical risks posed by their use are underlined (e.g., cyber stalking), as well as the strategies used by parents to address the negative influences that ICTs potentially bring into the family (e.g., redefining rules, installing monitoring software).

The increasing advances and incorporation of the ICTs into families' everyday life has earned a place of prominence in the research field. This is clear from the rising number of studies, especially empirical researches, addressing the relation of ICTs with family functioning in the last years, compared with its prevalence a decade and a half ago. Since this whole evolution of scientific literature on this subject is limited to this period, this systematic review was limited to publications from between 1998 and 2013.

Despite the growing scientific literature on this topic, some gaps were found. There is a lack of consensus on the prevalence of positive, negative or mixed aspects in the influence that ICTs have on families. We think that it is in part due to the diversity and non-standardization of instruments used, the differentiated type of samples considered, the variety of study designs, the multiplicity of variables considered in the studies and their differentiated operationalization, which allows us to get a kaleidoscopic view of this relation, hampering comparisons between them or achievement of consistent results. Besides that, in the increasingly media-saturated environment in which we live today, how

the media use of families differs according to the developmental stage seems an important gap in the literature.

Despite the effort put into making the research review on the subject as exhaustive as possible, it has some limitations. We recognize that it was impossible to include all of the existing literature as this has been limited to databases, search terms and languages mentioned. Furthermore, some of the studies presented appear somewhat outdated compared to the continuous technological developments, but were kept due to their methodological relevance or conceptual interest. Moreover, according to the Multitheoretical model of Hertlein (2012) there are some topics derived from our review which overlap in the structure and process of the relationships because they can be situated in more than one of the three elements.

Some studies suggest that ICTs are becoming a central dimension in the various stages of the family life cycle (e.g., Bacigalupe, 2011; Hertlein, 2012; Watt & White, 1999), with the individuals and families' adoption of these technologies varying not only according to their own characteristics (Aponte, 2009; Cardoso et al., 2008; Chesley & Fox, 2012; Huisman et al., 2012; Stern & Messer, 2009; Van Rompaey et al., 2001), but also due to their development stage (Bacigalupe, 2011; Coyne, Bushman, et al., 2012; Davies & Gentile, 2012; Lanigan, 2009; Mesch, 2006b; Watt & White, 1999). The Multitheoretical model of Hertlein (2012) "highlights the recursive nature of influence of technologies on families through discussing how family processes are adopted and integrated by families" (Hertlein, 2012, p. 376). According to this model and by examining the different interactions between technologies and family members, is possible to gain some insights about family functioning. For instance, the multiple relationships between the ecological influences, the rearrangements in the structure and in the process of families, may allow us to have a better understanding of what is signalized as adaptive or problematic to each

family. With the inclusion of ICTs in everyday life, on the one hand, and the dialectic of ensuring family identity and promoting the autonomy of its elements on the other, the challenge is put to families of the 21st century of integrating the characteristics of a network society into their relations: flexibility, autonomy and adaptability (Bacigalupe, 2011; Cardoso et al., 2008; Lanigan, 2009), which at least will result in the permanent and reciprocal update of familiar and technological processes, across the different stages of the family life cycle. The policy of spreading fear among families sheds more confusion in their midst, interfering with their own ability to manage the arrival of this "new family member": ICTs (Bacigalupe & Lambe, 2011; Sotero et al., 2011). Considering this point of view, in digital inclusion policies it is important to contemplate not only clear information about risks factors and damage prevention strategies (e.g., choice of suitable locations for placing ICTs), but also about their advantages and potentialities (e.g., strength family bonds; current daily management activities), for families to find ways to (re)adapt to these permanent changes by themselves.

Based on the above, future research should seek to: (a) use standardized measurement instruments, enabling the replication and the comparison of results, (b) favor longitudinal and mixed methods (quantitative/qualitative) in order to enable a wider and deeper understanding of this interaction, (c) expand the focus of analysis at the different stages of the family life cycle, explore the dimensions of family functioning and the types of technology most used in each stage, and (d) achieve psychosocial and clinical implications which are better adjusted to the influence of ICTs on family functioning, allowing the revitalization of the families' own competencies. This way, the relation between ICTs and family functioning seems to be, among many others, just one more challenge that can test each family in its creative development.

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Table

Table 1

Summary of the articles included in the review

Author(s)	Year	Country	Sample	Method				Instruments
				Cr.	L.	Qn.	Ql.	
Aponte	2009	USA						Articles reviewed
Bacigalupe	2011	USA						Articles reviewed
Bacigalupe & Camara	2011	Spain						Articles reviewed; case studies
Bacigalupe & Lambe	2011	USA						Articles review; case study
Bartholomew et al.	2012	USA	N = 304 parents		x	x		Questionnaire
Blinn-Pike	2009	USA						Articles reviewed
Cardoso et al.	2008	PT	1) children / youth[a]; 2) 1353 children / youth	x			x	Questionnaire: 1) presence; 2) online
Chesley & Fox	2012	USA	N = 5,034 individuals		x	x		Interview
Child & Westermann	2013	USA	N=235 dyads of parent child	x		x		Questionnaires
Coyne, Busby, et al.	2012	USA	N = 1,333 heterosexual couples	x		x		Questionnaire
Coyne, Bushman, et al.	2012	USA						Articles reviewed
Coyne et al.	2011	USA	N = 1,039 individuals in relationships	x		x		Questionnaire
Davies & Gentile	2012	USA	n = 527; n = 1.257 parents of children	x		x		Questionnaire;
Devitt & Roker	2009	UK	N = 60 families, with youths	x			x	Interviews; diary
Ganong et al.	2012	USA	N = 49 divorced co parents	x			x	Interviews
Gunuc & Dogan	2013	TR	N = 166 youths	x		x		Questionnaires
Haddon	2006	UK						Articles reviewed
Hertlein	2012	USA						Articles reviewed
Huisman et al.	2012	USA	N = 4 families	x			x	Interviews, questionnaires, TIC tracker
Kanter et al.	2012	USA	N = 118 dyads of parent child		x	x		Questionnaires
Kaur & Medury	2012	India	N = 346 dyads of parent child	x		x		Questionnaire
Kiesler	2000	USA	N = 237 (93 families)		x	x	x	Questionnaire; interviews;
Lanigan	2009	USA						Sociotechnical model applied to a study
Lee & Chae	2007	Korea	n = 222 children and parents	x		x		Questionnaire
Liu et al.	2012	China	N = 3778 individuals	x		x		Questionnaires
Livingstone	2007	UK	1) N = 2,281; 2) N = 2,417 parent/child		x	x		Questionnaire
Mesch	2003	Israel	N = 1,000 Israeli families with youths	x		x		Interviews

Mesch	2006	USA	n = 754 youths and parents	x		x		Interviews
Mesch	2006	Israel	n = 396 youths and their parents	x		x		Interviews
Mickus & Luz	2002	USA	N = 20 (pairs of residents and familiars)		x		x	Questionnaires
Nie	2001	USA						Review of four researches
PadillaWalker et al.	2012	USA	N = 453 families (parents and adolescents)		x	x		Interviews; questionnaire
Plowman et al.	2010	UK	n = 346 families and n = 24 case studies		x		x	Questionnaire; interviews; observation
Şenyürekl & Detzner	2009	USA	N = 30 Turkish families living in the U.S.	x			x	Interview
Schneider et al.	2012	USA	N = 35 spouses of cybersex users	x			x	Questionnaire online
Stafford & Hillyer	2012	USA						Articles reviewed
Stern & Messer	2009	USA	N = 2,000 households	x		x		Questionnaire
Stevenson	2011	UK	n = 570 adolescents and n = 34 (8 families)	x			x	Questionnaire; interview; observation; diary
Van Rompaey et al.	2002	B	1) N = 900 families; 2) N = 31 families	x		x	x	Interviews; questionnaire
Wang et al.	2005	USA	N = 749 dyads of parent-children	x		x		Interview
Watt & White	1999	USA						Articles reviewed
Williams & Merten	2011	USA	1) N = 386; 2) N = 696 parents and child	x		x		Interviews

Notes. *USA* United States of America; *PT* Portugal; *UK* United Kingdom; *B* Belgium; *TR* Turkey; *1)* First study; *2)* Second study; *N* total sample; *n* sub sample;
Cr. cross-sectional; *L*. longitudinal; Q*n*. quantitative; Q*l*. qualitative.
[a] ongoing research at the time of publication, the sample was not provided.